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TITLE: Navigation apparatus

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## U.S. PATENT DOCUMENTS

Search Selected

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PAT-NO

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## FOREIGN PATENT DOCUMENTS

FOREIGN-PAT-NO	PUBN-DATE	COUNTRY	US-CL
A1 11-6739	January 1999	JP	

ART-UNIT: 3661

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ABSTRACT:

A navigation apparatus includes a map database that records map data in a fixed storage medium, a map data read section for reading map data from the map database, and a navigation section for detecting the location of local apparatus, calculating a route to a destination specified by the user, and giving guidance to the destination according to the route, a map information acquisition section for acquiring map information from outside the navigation apparatus, and a map information update section for updating the map database with the map information acquired by the map information acquisition section. The navigation section includes an emphasis display section that displays updated data detected in a difference data detecting section, in an emphasized way, and an emphasis voice guidance section that emphasizes the data detected in the difference data detecting section.

13 Claims, 36 Drawing figures

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Abstract Text (1):

A navigation apparatus includes a map database that records map data in a fixed storage medium, a map data read section for reading map data from the map database, and a navigation section for detecting the location of local apparatus, calculating a route to a destination specified by the user, and giving guidance to the destination according to the route; a map information acquisition section for acquiring map information from outside the navigation apparatus, and a map information update section for updating the map database with the map information acquired by the map information acquisition section. The navigation section includes an emphasis display section that displays updated data detected in a difference data detecting section, in an emphasized way, and an emphasis voice guidance section that emphasizes the data detected in the difference data detecting section.

Brief Summary Text (5):

FIG. 34 is a block diagram showing a related art navigation apparatus shown for example in the Japanese Patent Laid-Open No. Hei.-11-6739. In the figure, a numeral 300 represents a basic map information storage medium for storing basic map information, 10 a navigation section for performing navigation referring to map information including basic map information, 11 a gyro sensor for detecting the location of local apparatus, 12 a display for displaying map information, 400 an additional information storage medium for storing difference information used to form the latest map data, 20 a synthesizer for synthesizing map information stored in the basic map information storage medium 300 and additional information stored in the additional information storage medium 400, 100 a GPS satellite for originating a GPS signal used to detect, in cooperation with the gyro sensor, the location of the local apparatus, and 200 a sending station for originating traffic jam information.

Brief Summary Text (10):

Navigation apparatus according to the first aspect of the invention is a navigation apparatus comprising a map database that records map data in a fixed storage medium, a map data read section for reading map data from the map database, and a navigation section for detecting the location of local apparatus, calculating a proper route to a destination specified by the user, and giving guidance to the destination according to the route, characterized in that the navigation apparatus comprises a map information acquisition section for acquiring map information from outside the navigation apparatus and a map information update section for updating the map database with the map information acquired by the map information acquisition section, that the navigation section comprises an emphasis display section for displaying the data detected in a difference data detecting section in an emphasized way and an emphasis voice guidance section for giving emphasis guidance of the data detected in the difference data detecting section, and that the map information update section comprises a difference data detecting section for detecting modified data from the map data read by the map data read section in

the map information acquired by the map information acquisition section and a map information merging section for merging map data read by the map data read section and map information acquired by the map information acquisition section to generate updated map data.

Brief Summary Text (17):

A navigation apparatus according to the eighth aspect of the invention comprises an emphasis management section for managing the emphasis method, characterized in that the emphasis management section comprises a due date information detecting section for detecting due date information in case due date information is included in the difference data detected in the difference data detecting section and a due date emphasis instructing section for instructing due date emphasis to the emphasis display section or an emphasis voice guidance section according to the due date described in the due date information detected by the due date information detecting section.

Brief Summary Text (20):

A navigation apparatus according to the eleventh aspect of the invention is characterized in that the difference data detecting section comprises a difference area calculating section for calculating the geographical area where difference data is present and that the emphasis display section shows that difference data is present in the lower-layer map data in case the geographical area calculated by the difference area calculating section is contained in the lower layer of the displayed map data.

Detailed Description Text (3):

FIG. 1 is a block diagram explaining the configuration of a navigation apparatus according to First embodiment of the invention. In FIG. 1, a numeral 1 represents a map database, 2 a map data read section, 3 a map information acquisition section, 4 a map information update section, 5 a navigation section, 41 a difference data detecting section, 42 a map information merging section, 51 an emphasis display section, and 52 an emphasis voice guidance section.

Detailed Description Text (4):

The map database 1 is map data stored on a fixed storage medium such as a DVD-ROM and a CD-ROM. Map data stored in the map database 1 is read by the map data read section 2. The map information acquisition section 3 acquires the latest map information from outside the navigation apparatus via radio communications such as a portable telephone set. The map information update section 4 synthesizes, in the map merging section 42 the latest map data of a format that can be recognized by the navigation section 5, based on the map data read by the map data read section 2 from the map data read section 2 and the latest map information acquired by the map information acquisition section 3. The navigation section 5 performs navigation such as route calculation and guidance to the destination based on the synthesized latest map data.

Detailed Description Text (5):

In this practice, the difference data detecting section 41 of the map information update section 4 detects difference data between the map data read by the map data read section 2 from the map database 1 and the latest map information acquired by the map information acquisition section 3. The detected difference data is passed to the navigation section 5 and the section corresponding to the difference data is displayed emphatically on the display (not shown), unlike ordinary display method. Or, the difference data is emphasized in a voice guidance by the emphasis voice guidance section, unlike ordinary voice guidance.

Detailed Description Text (6):

In case the difference data is displayed emphatically by the emphasis display section, the emphasis display is made via methods such as a method where a different color from that used for ordinary display is used, a method where the

type or thickness of a line is difference from that used in ordinary display, a method where the section corresponding to the difference data is blinking, and a method where the section corresponding to the difference data is represented in character strings.

Detailed Description Text (12):

When the map information acquisition section 3 acquires items whose map data contents stored in the map database 1 can be updated, by acquiring map information from outside, the acquirable information presenting section 31 presents items that can be updated to the user. Presentation of items that can be updated to the user includes presentation of a geographical area that can be updated or items that can be updated such as road information that can be updated and facility information that can be updated. The user utilizes the target information selecting section 32 to select information to be updated from the items presented. The map information acquisition section 3 acquires from outside only the map information on the items specified by the user. The subsequent operation is the same as that in First embodiment.

Detailed Description Text (22):

The emphasis management section 6 determines emphasis display on the difference data, or the timing of emphasis voice guidance or level of emphases (emphasis level). The timing of starting emphasis is determined by the emphasis start determination section 61. In case emphasis display of difference data is made, the timing of ending emphasis display is determined by the emphasis display end determination section 62. The emphasis display level determination section 63 determines the level of emphasis display. This determination is made in accordance with the level described in the map information, if any, to the user specification in case the user specifies the level, or to the freshness of individual information described in the map information, if any.

Detailed Description Text (23):

FIG. 7 is a flowchart explaining the operation of a navigation apparatus according to Sixth embodiment of the invention. When difference data is detected by the difference data detecting section 41 (S7) and, as a result of this processing, it is determined that the difference data is present (S8), the emphasis start determination section 61 determines start of emphasis (S9). When this determination is made, the emphasis management section 6 instructs the emphasis voice guidance section 52 to give voice guidance such as "Data on the national road No. XX has been updated" (S10).

Detailed Description Text (26):

When difference data is detected by the difference data detecting section 41 (S7) and, as a result of this processing, it is determined that the difference data is present (S8), the emphasis start determination section 61 presents detection of difference data to the user (S11) and waits for the user's determination on whether the data is to be emphasized (S12). When the user's determination on whether the data is to be emphasized is input, the emphasis start determination section 61 determines whether the input pertains to an instruction of emphasis (S13). In case the result pertains to an instruction of emphasis (S14), the emphasis start determination section 61 determines start of emphasis (S9). When this determination is made, the emphasis management section 6 instructs the emphasis voice guidance section 52 to give voice guidance such as "Data on the national road No. XX has been updated" (S10).

Detailed Description Text (29):

When difference data is detected by the difference data detecting section 41 (S7) and, as a result of this processing, it is determined that the difference data is present (S8), the emphasis start determination section 61 obtains the location of difference data on the map (S15). Then the emphasis start determination section 61 acquires a display range on the current display (S16). The emphasis start

determination section 61 then determines whether the location of the difference data obtained in S15 falls within the range acquired in S16 (S17). In case the location of the difference data does not fall within the range, execution returns to S16. In case the location of the difference data falls within the range, the emphasis start determination section 61 determines start of emphasis (S18). When this determination is made, the emphasis management section 6 instructs the emphasis display section 51 to provide emphasis display of the difference data (S19).

Detailed Description Text (32):

When it is determined that the location of the difference data falls within the display range in S17 in the procedure similar to that in Eighth embodiment, the emphasis start determination section 61 presents detection of difference data to the user (S11) and waits for the user's determination on whether the data is to be emphasized (S12). When the user's determination on whether the data is to be emphasized is input, the emphasis start determination section 61 determines whether the input pertains to an instruction of emphasis (S13). In case the result pertains to an instruction of emphasis (S14), the emphasis start determination section 61 determines start of emphasis (S18). When this determination is made, the emphasis management section 6 instructs the emphasis display section 51 to provide emphasis display of difference data (S19)

Detailed Description Text (35):

When difference data is detected by the difference data detecting section 41 (S7) and, as a result of this processing, it is determined that the difference data is present (S8), the emphasis start determination section 61 obtains the location of difference data on the map (S15). Then the emphasis start determination section 61 determines the relationship between the location of the difference data thus obtained and the neighborhood of the current location of the local vehicle (S20), and determines whether the location of the difference data falls within the neighborhood of the current location of the local vehicle (S21). In case the emphasis start determination section 61 determines that the location of the difference data does not fall within the neighborhood of the current location of the local vehicle, execution returns to S20. In case the emphasis start determination section 61 determines that the location of the difference data falls within the neighborhood of the current location of the local vehicle, the emphasis start determination section 61 determines start of emphasis (S18). When this determination is made, the emphasis management section 6 instructs the emphasis display section 51 to provide emphasis display of the difference data (S19).

Detailed Description Text (38):

When it is determined that the location of the difference data falls within the neighborhood of the current location of the local vehicle in S21 in the procedure similar to that in Tenth embodiment, the emphasis start determination section 61 determines start of emphasis (S9). When this determination is made, the emphasis management section 6 instructs the emphasis voice guidance section 52 to give voice guidance such as "Data on the national road No. XX has been updated" (S10).

Detailed Description Text (41):

When it is determined that the location of the difference data falls within the neighborhood of the current location of the local vehicle in S21 in the procedure similar to that in Tenth embodiment, the emphasis start determination section 61 presents detection of difference data to the user (S11) and waits for the user's determination on whether the data is to be emphasized (S12). When the user's determination on whether the data is to be emphasized is input, the emphasis start determination section 61 determines whether the input pertains to an instruction of emphasis (S13). In case the result pertains to an instruction of emphasis (S14), the emphasis management section 6 instructs the emphasis display section 51 to provide emphasis display of difference data (S19).

Detailed Description Text (44):

When it is determined that the user's input pertains to an instruction of emphasis in S14 in the procedure similar to that in Twelfth embodiment, the emphasis start determination section 61 determines start of emphasis (S9). When this determination is made, the emphasis management section 6 instructs the emphasis voice guidance section 52 to give voice guidance such as "Data on the national road No. XX has been updated" (S10).

Detailed Description Text (47):

When difference data is detected by the difference data detecting section 41 (S7) and, as a result of this processing, it is determined that the difference data is present (S8), as shown in FIG. 15A, the emphasis start determination section 61 stores the difference data (S22). Receiving the user's input to instruct start of emphasis (S23), as shown in FIG. 15B, the emphasis start determination section 61 notifies the navigation section 5 of the difference data stored in S22 (S24). The emphasis start determination section 61 then determines start of emphasis display (S18). When this determination is made, the emphasis management section 6 instructs the emphasis display section 51 to provide emphasis display of the difference data (S19).

Detailed Description Text (48):

While start of emphasis display is determined and emphasis display instructed in S18 and S19 after difference data has been notified to the navigation section 5 in this example, it is possible to determine start of emphasis voice guidance and instruct emphasis voice guidance. Difference data notified to the navigation section 5 in S24 may be restricted to data that falls within the display range of the current display or data that falls within the neighborhood of the current location of the local vehicle.

Detailed Description Text (51):

When the emphasis management section 6 instructs the emphasis display section 51 to provide emphasis display of the difference data (S19), the emphasis display end determination section 62 calculates the elapsed time since S19 (S25) and determines whether the elapsed time has exceeded the preset time (S26). In case it is determined that the elapsed time has not exceeded the preset time, execution returns to S25. In case it is determined that the elapsed time has exceeded the preset time, end of emphasis display is determined (S27) and the emphasis management section 6 instructs the emphasis display section 51 to end emphasis display (S28).

Detailed Description Text (57):

When difference data is detected by the difference data detecting section 41 (S7) and, as a result of this processing, it is determined that the difference data is present (S8), as shown in FIG. 18A, the emphasis display level determination section 63 reads the emphasis level of individual data (S30) and sets the emphasis level corresponding to the individual data in accordance with the read emphasis level (S31).

Detailed Description Text (64):

When difference data is detected by the difference data detecting section 41 (S7) and, as a result of this processing, it is determined that the difference data is present (S8), the emphasis display level determination section 63 reads time information on individual data described in the difference data (S35). The emphasis display level determination section 63 determines the emphasis level according to the read time information (S36) and sets determined emphasis level corresponding to individual data (S31). The subsequent operation is the same as that in Seventeenth embodiment.

Detailed Description Text (67):

The emphasis unit determination section 64 receives the user's setting of items to

be emphasized such as roads and facilities in advance, and stores the setting as emphasis unit information 65. When the difference data detecting section 41 detects difference data, the emphasis unit information 65 is used to determine whether the difference data is included in the items set via the user specification. In case the difference data is included in the set items, the difference data is emphasized, same as Fifth embodiment.

Detailed Description Text (70):

The emphasis display level determination section 63 updates the usage history (not shown) of map data each time the navigation section 5 uses the map data to implement various features and thus learns characteristics on the usage frequency of map data. The usage characteristics learned by the map data usage characteristics learning section 53 is sent to the emphasis detail level determination section 66. The emphasis detail level determination section 66, receiving the usage characteristics of map data, determines the detail level of emphasis of difference data based on the usage characteristics, in accordance with the usage frequency of the map data within the range containing difference data to be emphasized. The emphasis detail level determination section 66 determines the emphasis level so that the details of modifications presented to the user is changed depending on the usage frequency in the following way. Difference data that belongs to map data that is frequently used can possibly be the map data in the neighborhood of locations frequented by the user. The emphasis detail level determination section 66 presents details of update in such difference data. Meanwhile, the emphasis detail level determination section 66 presents only the fact that the data has been modified to the user in case the difference data belongs to map data that is less frequently used.

Detailed Description Text (74):

When difference data is detected by the difference data detecting section 41 (S7) and, as a result of this processing, it is determined that the difference data is present (S8), the period information detecting section 67 reads period information from the difference data (S37). When it is determined that period information is read (S38), information type of the information described as period information, that is, due date information or prior notice information, is acquired (S39). In case the acquired information type is due date information (S40), the current time is compared with the due date information (S41) and it is determined whether the due date indicated by the due date information has expired (S42). In case it is determined that the due date has expired, the due date emphasis instructing section 68 specifies the original data corresponding to the difference data as emphasis target data to the navigation section 5 (S43). In case it is determined that the due date has not expired, the due date emphasis instructing section 68 specifies the difference data as emphasis target data to the navigation section 5 (S46).

Detailed Description Text (75):

When it is determined that the period information is prior notice information in S40, the current time is compared with the prior notice information (S44) to determine whether the prior notice date has expired (S45). In case it is determined that the prior notice date has expired, the period emphasis instructing section 68 specifies the difference data as emphasis target data to the navigation section 5 (S46). In case it is determined that the prior notice date has not expired, the period emphasis instructing section 68 calculates the time period prior notice emphasis is made (S47) and it is determined whether the current time is included in the prior notice emphasis time period (S48). In case the current time is included in the prior notice emphasis term, the period emphasis instructing section 68 specifies the difference data as emphasis target data to the navigation section 5 (S46).

Detailed Description Text (76):

In case it is determined that period information is not present in the difference data in S38, the period emphasis instructing section 68 specifies the difference



data as emphasis target data to the navigation section 5 (S46).

Detailed Description Text (88):

When difference data is detected by the difference data detecting section 41, a difference area calculating section 411 calculates the range indicated by the map data and retains the range as difference area information (not shown).

Detailed Description Text (89):

In case, when map data read by the map data read section 2 or map data obtained by merging map data read by the map data read section 2 and map information acquired by the map information acquisition section 3 are sent from the map information update section 4 to the 5, the map data includes an area indicated by difference area information in the lower-layer map data, the emphasis display section 51 notifies on the display that the lower layer of the displayed map contains an area where difference data is present.

Detailed Description Text (90):

FIG. 29 is a block diagram explaining the operation of navigation apparatus according to Twenty-sixth embodiment of the invention. FIG. 28 is an example that uses a rectangle such as P to show that the lower layer contains an area where difference data is present.

Detailed Description Text (91):

According to the navigation apparatus of the first aspect of the invention, it is possible to specify to the user the modifications to the information related to the map by presenting data corresponding to the updated map-related information via a method that is different from an ordinary display or voice guidance, and the user can properly make decision based on the map information by recognizing the modifications.

Detailed Description Text (92):

According to the navigation apparatus of the second aspect of the invention, it is possible to present in advance the updated map-related information to be acquired, and the user can specify the target data thus allowing operation tailored to the user's needs as well as reducing the data volume of information to be acquired from outside.

Detailed Description Text (100):

According to the navigation apparatus of the tenth aspect of the invention, when difference data is acquired anew in the same map area, the emphasis level of the existing difference data is changed. This reduces the user's confusion on the freshness of individual difference data.

Detailed Description Text (101):

According to the navigation apparatus of the eleventh aspect of the invention, while the map data of an upper layer is presented on the display, difference data in the map data of a lower layer is displayed. Thus the user is let to know in advance whether difference data is acquired from outside when switching the display from the upper layer to the lower layer.

CLAIMS:

1. A navigation apparatus comprising: a map database that records map data in a fixed storage medium; a map data read section for reading the map data from the map database; a navigation section for detecting the location of a local apparatus, calculating a route to a destination specified by a user, and giving guidance to the destination according to the route; a map information acquisition section for acquiring map information from outside the navigation apparatus; a map information update section for updating the map database with the map information acquired by the map information acquisition section, wherein the map information update section

comprises a difference data detecting section for detecting modified data as the difference between the map data read by the map data read section and the map information acquired by the map information acquisition section; a map information merging section for merging map data read by the map data read section and map information acquired by the map information acquisition section to generate updated map data, wherein the navigation section comprises an emphasis display section for displaying the modified data detected in the difference data detecting section in an emphasized way such that displayed map data read by the map data read section is distinguishable from displayed map information acquired by the map information acquisition section; and an emphasis voice guidance section providing emphasized guidance of the modified data detected in the difference data detecting section.

8. The navigation apparatus according to claim 1, further comprising an emphasis management section for managing emphasis, wherein the emphasis management section comprises a period information detecting section for detecting period information when period information is included in the difference data detected in the difference data detecting section and including a period emphasis instructing section for instructing the emphasis display section or the emphasis voice guidance section to provide period emphasis according to the period described in the period information detected by the period information detecting section.

11. The navigation apparatus according to claim 1, wherein the difference data detecting section comprises a difference area calculating section for calculating a geographical area where difference data is present and the emphasis display section shows that difference data is present in lower-layer map data when the geographical area is in the lower-layer map data of the map data displayed.

12. A navigation apparatus comprising: a map database that records map data in a fixed storage medium; a map data read section for reading the map data from the map database; a navigation section for detecting the location of a local apparatus, calculating a route to a destination specified by a user, and giving guidance to the destination according to the route; a map information acquisition section for acquiring map information from outside the navigation apparatus; a map information update section for updating the map database with the map information acquired by the map information acquisition section, wherein the map information update section comprises a difference data detecting section for detecting modified data as the difference between the map data read by the map data read section and the map information acquired by the map information acquisition section; and a map information merging section for merging map data read by the map data read section and map information acquired by the map information acquisition section to generate updated map data, wherein the navigation section comprises an emphasis display section for displaying the modified data detected in the difference data detecting section in an emphasized way such that displayed map data read by the map data read section is distinguishable from displayed map information acquired by the map information acquisition section.

13. A navigation apparatus comprising: a map database that records map data in a fixed storage medium; a map data read section for reading the map data from the map database; a navigation section for detecting the location of a local apparatus, calculating a route to a destination specified by a user, and giving guidance to the destination according to the route; a map information acquisition section for acquiring map information from outside the navigation apparatus; a map information update section for updating the map database with the map information acquired by the map information acquisition section, wherein the map information update section comprises a difference data detecting section for detecting modified data as the difference between the map data read by the map data read section and the map information acquired by the map information acquisition section; and a map information merging section for merging map data read by the map data read section and map information acquired by the map information acquisition section to generate updated map data, wherein the navigation section comprises an emphasis voice

guidance section for providing emphasized voice guidance of the modified data  
detected in the difference data detecting section.

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